Finding Your Way Around
the TI-83+/84+ Graphing Calculator

Pre-Calculus

MathBits.com

Working with Matrices

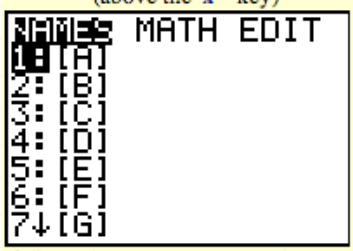
Matrices are rectangular arrays of elements.
The ***dimension*** of a matrix is the number of rows by the number of columns.

Adding Matrices - matrices must be of the *same dimension* to be added.

Add: $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} + \begin{bmatrix} 2 & 2 & 4 \\ 3 & 3 & 2 \end{bmatrix}$

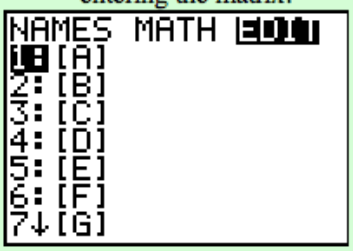
First Enter the Matrices (one at a time):

Step 1: Go to **Matrix**
(above the x^{-1} key)

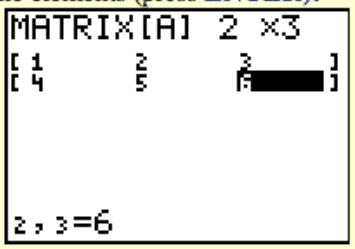


If dimensions appear next to the names of the matrices, such as 3x3, a matrix is already stored in the calculator. You may save it by moving to a new name, or overwrite it.

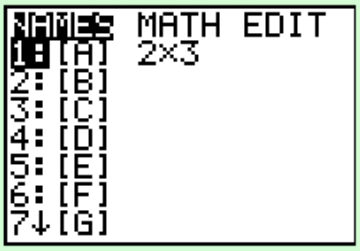
Step 2: Arrow to the right to **EDIT** to allow for entering the matrix.



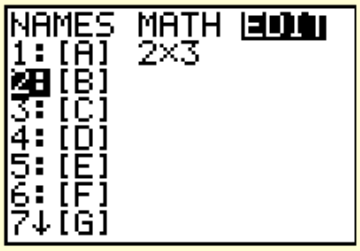
Step 3: Type in the dimensions (size) of your matrix and enter the elements (press **ENTER**).



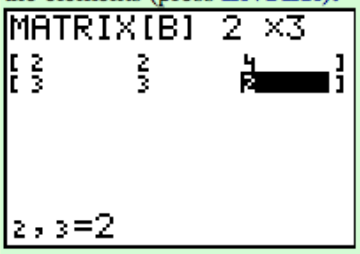
Step 4: Repeat this process for the second matrix



Step 5: Arrow to the right to **EDIT** and choose a new name.

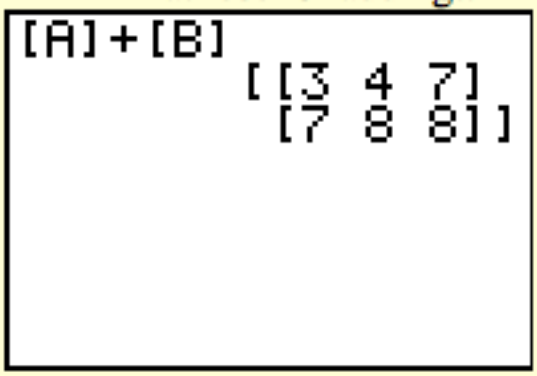


Step 6: Type in the dimensions (size) of your matrix and enter the elements (press **ENTER**).



Now, add:

Step 7: Return to the home screen. Go to **Matrix** to get the names of the matrices for adding..



The answer to the addition, as seen on the calculator screen, is =

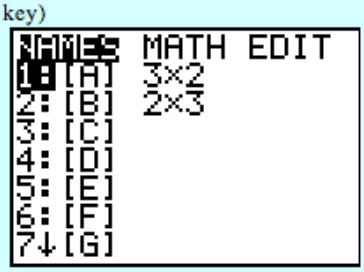
$$\begin{bmatrix} 3 & 4 & 7 \\ 7 & 8 & 8 \end{bmatrix}$$

Multiplying Matrices - for multiplication to occur, the ***dimensions*** of the matrices must be related in the following manner: ***m x n*** **times** ***n x r*** **yields** ***m x r***

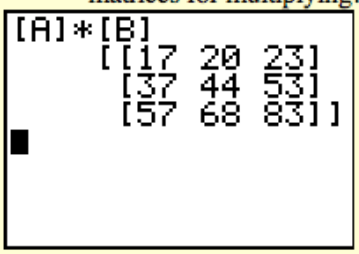
Multiply: $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \bullet \begin{bmatrix} 3 & 4 & 7 \\ 7 & 8 & 8 \end{bmatrix}$

First Enter the Matrices (one at a time) as shown above:

Step 1: Once the matrices are entered, you should see their dimensions in residence when you go to **Matrix** (above the x^{-1} key)



Step 2: Return to the home screen. Go to **Matrix** to get the names of the matrices for multiplying.



The product, as seen on the calculator screen, is =

$$\begin{bmatrix} 17 & 20 & 23 \\ 37 & 44 & 53 \\ 57 & 68 & 83 \end{bmatrix}$$

Using Matrices to Solve Systems of Equations:

1. *(using the inverse coefficient matrix)*

Write this system as a matrix equation and solve: $3x + 5y = 7$ and $6x - y = -8$

Step 1: Line up the x, y and constant values.

$$\begin{aligned} 3x + 5y &= 7 \\ 6x - y &= -8 \end{aligned}$$

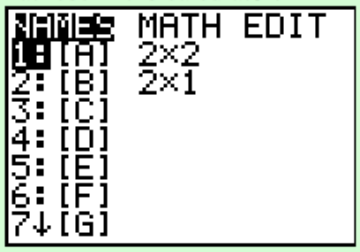
Step 2: Write as equivalent matrices.

$$\begin{bmatrix} 3x & 5y \\ 6x & -y \end{bmatrix} = \begin{bmatrix} 7 \\ -8 \end{bmatrix}$$

Step 3: Rewrite to separate out the variables.

$$\begin{bmatrix} 3 & 5 \\ 6 & -1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ -8 \end{bmatrix}$$

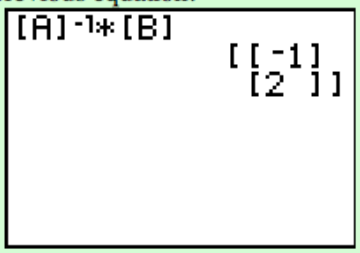
Step 4: Enter the two numerical matrices in the calculator.



Step 5: The solution is obtained by multiplying both sides of the equation by the inverse of the matrix which is multiplied times the variables.

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 & 5 \\ 6 & -1 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 7 \\ -8 \end{bmatrix}$$

Step 6: Go to the home screen and enter the right side of the previous equation.



The answer to the system, as seen on the calculator screen, is $x = -1$ and $y = 2$.

2. *(using Gauss-Jordan elimination method with reduced row echelon form)*
Solve this system of equations:

$$2x - 3y + z = -5$$
$$4x - y - 2z = -7$$
$$-x + 2z = -1$$

Step 1: Line up the variables and constants

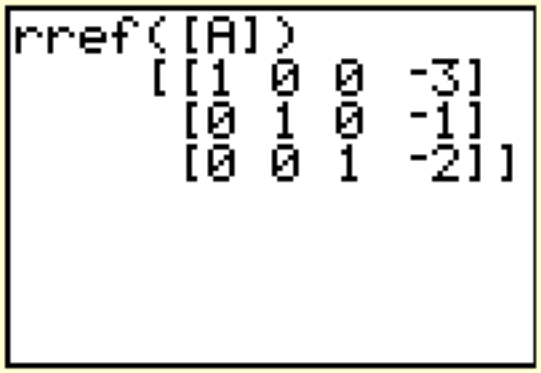
$$2x - 3y + z = -5$$
$$4x - y - 2z = -7$$
$$-x + 0y + 2z = -1$$

Step 2: Write as an augmented matrix and enter into calculator.

$$\begin{bmatrix} 2 & -3 & 1 & -5 \\ 4 & -1 & -2 & -7 \\ -1 & 0 & 2 & -1 \end{bmatrix}$$

Step 3: From the home screen, choose the **rref** function. [Go to **Matrix** (above the x^{-1} key), move right→**MATH**, choose **B: rref]**

Step 4: Choose name of matrix and hit **ENTER**.



Step 5: The answer to the system, will be the last column on the calculator screen:

$$x = -3$$
$$y = -1$$
$$z = -2.$$